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(71)Applicant : ASAHI OPTICAL CO LTD

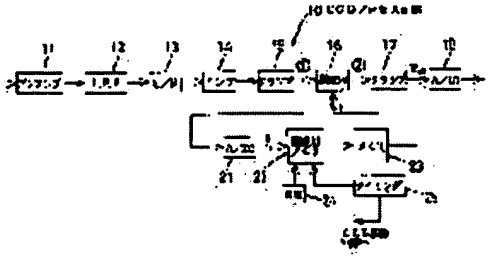
(72)Inventor : SUGIMOTO HIDEO
OZAWA SATORU

(54) ELECTRONIC ENDOSCOPE DEVICE

(57)Abstract:

PURPOSE: To provide an electronic endoscope device capable of reproducing an image with high quality even when dispersion between picture elements exists in the amplitude of a signal of saturation level outputted from each picture element of a solid-state image pickup element.

CONSTITUTION: This device is provided with saturation level amplitude correction circuits 21, 22 and 23 to correct the signal level of each picture element so as to arrange the amplitude of saturation level of the signal of each picture element at the minimum level required for the input dynamic range of an analog/digital conversion circuit 18 before an image pickup signal is inputted to the analog/digital conversion circuit 18.



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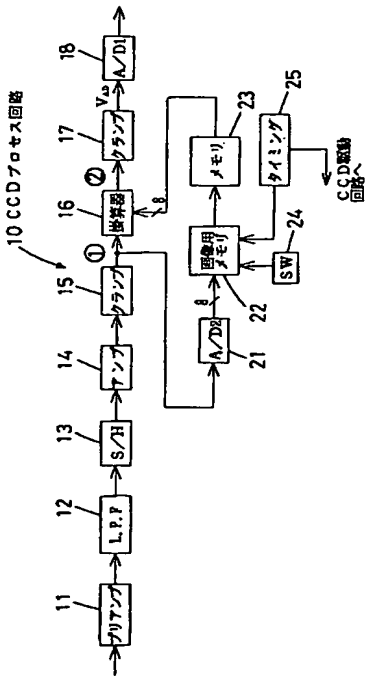
(54)【発明の名称】　電子内視鏡装置

(57)【要約】

【目的】固体撮像素子の各画素から出力される飽和レベルの信号の振幅に画素間でばらつきがあっても、品質の良い画像を再生することのできる電子内視鏡装置を提供することを目的とする。

【構成】撮像信号をアナログデジタル変換回路１８に入力させる前に、各画素の信号の飽和レベルの振幅の大きさをアナログデジタル変換回路の１８入力ダイナミックレンジに必要な最小限程度のレベルに揃えるように各画素の信号レベルを補正するための飽和レベル振幅補正回路２１，２２，２３を設けた。



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【特許請求の範囲】

【請求項１】内視鏡挿入部の先端に配置された固体撮像素子から出力されたアナログ信号をサンプルホールド回路でサンプリングして撮像信号を抽出し、それを増幅してからアナログデジタル変換回路でデジタル信号に変換するようにした電子内視鏡装置において、

上記撮像信号を上記アナログデジタル変換回路に入力させる前に、各画素の信号の飽和レベルの振幅の大きさを上記アナログデジタル変換回路の入力ダイナミックレンジに必要な最小限程度のレベルに揃えるように各画素の信号レベルを補正するための飽和レベル振幅補正回路を設けたことを特徴とする電子内視鏡装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、観察画像を電気信号に変換する固体撮像素子を内視鏡挿入部の先端に設けた電子内視鏡装置に関する。

【０００２】

【従来の技術】図１０は従来の電子内視鏡装置を示しており、内視鏡挿入部の先端に配置された固体撮像素子（図示せず）から出力されたアナログ信号が、まずプリアンプ５１で適当なレベルに増幅された後、ローパスフィルタ５２において高周波成分等がカットされる。

【０００３】次いで、サンプルホールド回路５３において固体撮像素子の各画素からの出力信号がサンプリングされて撮像信号が抽出され、その信号が、アナログデジタル変換回路５６の入力ダイナミックレンジを越える程度まで次の増幅器５４で増幅された後、クランプ回路５５で片側の直流レベルを揃える波形整形が行われる。

【０００４】そしてその信号が、アナログデジタル変換回路５６においてデジタル信号に変換された後、図示されていない次の画像処理回路に送られて、カラー画像を再生するためのビデオ信号が生成される。

【０００５】

【発明が解決しようとする課題】上述のような回路において、固体撮像素子の各画素から出力される信号の飽和レベルの振幅には画素間でばらつきがある。

【０００６】即ち、図１１は、固体撮像素子の各画素から飽和レベルの信号が順に出力される場合の、サンプルホールド回路５３への入力信号①と出力信号②を例示しており、振幅のばらつきが増幅器５４で増幅されてそのまま現れている。V_{AD}は、アナログデジタル変換回路５６入力のダイナミックレンジ、Ａｖは増幅器５４の利得である。

【０００７】このように、各画素から出力される信号の飽和レベルの振幅の画素間のばらつきがサンプルホールド回路５３の入出力にそのまま現れるので、もしサンプルホールド回路５３への入力レベルがダイナミックレンジを下回る画素信号があると、その画素は黒点として画像表示され、画像品質を著しく損なうことになる。

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【０００８】しかし、そのような現象を避けるために増幅器５４の増幅率を上げると、画像ノイズが目立つようになって、今度は画像品質が全体的に低下してしまうことになる。

【０００９】そこで本発明は、固体撮像素子の各画素から出力される飽和レベルの信号の振幅に画素間でばらつきがあっても、品質の良い画像を再生することのできる電子内視鏡装置を提供することを目的とする。

【００１０】

【課題を解決するための手段】上記の目的を達成するため、本発明の電子内視鏡装置は、内視鏡挿入部の先端に配置された固体撮像素子から出力されたアナログ信号をサンプルホールド回路でサンプリングして撮像信号を抽出し、それを増幅してからアナログデジタル変換回路でデジタル信号に変換するようにした電子内視鏡装置において、上記撮像信号を上記アナログデジタル変換回路に入力させる前に、各画素の信号の飽和レベルの振幅の大きさを上記アナログデジタル変換回路の入力ダイナミックレンジに必要な最小限程度のレベルに揃えるように各画素の信号レベルを補正するための飽和レベル振幅補正回路を設けたことを特徴とする。

【００１１】

【実施例】図面を参照して実施例を説明する。図２は電子内視鏡装置の全体構成を示す略図であり、内視鏡１の挿入部の先端に内蔵された例えば電荷結合素子（ＣＣＤ）からなる固体撮像素子２によって内視鏡観察画像が撮像され、その固体撮像素子２から出力される信号が、内視鏡１に接続されたビデオプロセッサ３に送られて、ビデオプロセッサ３中のＣＣＤプロセス回路１０に入力される。

【００１２】図１は、ＣＣＤプロセス回路１０を示しており、固体撮像素子２から出力されたアナログ信号が、まずプリアンプ１１で適当なレベルに増幅された後、ローパスフィルタ１２において高周波成分等がカットされる。

【００１３】次いで、サンプルホールド回路１３において固体撮像素子２の各画素からの出力信号がサンプリングされて撮像信号が抽出され、その信号が、主アナログデジタル変換回路１８の入力ダイナミックレンジを越える程度まで次の増幅器１４で増幅された後、クランプ回路１５で片側の直流レベルを揃える波形整形が行われる。ここまでは、図１０に示した従来の回路と同じである。

【００１４】そのクランプ回路１５から出力される①における信号は、図３に示されるように、各画素から出力される信号の飽和レベルの振幅にばらつきのある映像信号である。

【００１５】クランプ回路１５の出力端には、入力されるアナログ信号に対して、８ビットのデジタルデータによって増幅度を高精度に制御することのできる高精度増

幅器（以下、「掛算器」という）１６が接続されると共に、例えば８ビットのデジタルデータを出力する補正用アナログデジタル変換回路２１が分岐接続されている。

【００１６】この実施例においては、内視鏡を使用する際に先ず準備として、非常に明るい被写体を固体撮像素子２で撮像して全ての画素からの出力信号を飽和状態にし、その信号を補正用アナログデジタル変換回路２１に入力させる。

【００１７】そして、固体撮像素子２の全ての画素の飽和レベルの信号を、次の画像用メモリ２２に記憶させる。そのような準備動作は、例えばビデオプロセッサ３の操作パネルに配置されたスイッチ２４が押された時だけ行われるものとする。

【００１８】全ての画素の飽和レベルの信号が画像用メモリ２２に記憶された後の通常観察状態においては、タイミング回路２５によって固体撮像素子２の駆動と同期をとって、各画素に対応した飽和レベルデータが画像用メモリ２２から出力される。したがって、その状態になれば、補正用アナログデジタル変換回路２１の機能はもはや使用されない。

【００１９】画像用メモリ２２から出力されたデータは、補正係数が格納された補正係数格納メモリ２３に入力される。補正係数は、例えば図４に示されるような画像用メモリ２２から入力されるデータＶ１～Ｖ４を、全て主アナログデジタル変換回路１８の入力のダイナミックレンジV_{AD}に揃えるように補正するための係数である。

【００２０】このようにして、各画素に対応する補正係数が補正係数格納メモリ２３から出力されて掛算器１６に入力され、掛算器１６の増幅率が画素毎に制御される。その結果、掛算器１６から出力される図１の②における各画素の飽和レベルの信号振幅は、図５に示されるように、全ての画素において主アナログデジタル変換回路１８の入力のダイナミックレンジV_{AD}に揃えられる。

【００２１】次いで、掛算器１６から出力される信号は、クランプ回路１７で片側の直流レベルを揃える波形整形が行われた後、主アナログデジタル変換回路１８でデジタル信号に変換されて、ビデオ信号を生成するための画像処理回路に向けて出力される。

【００２２】図６は、上述の信号補正を行う回路部分をさらに詳しく説明するためのブロック図であり、クランプ回路１５から出力される２．０ＶｐｐのＶｉｎ）が減衰器（ＡＴＴ）２７に入力され、補正用アナログデジタル変換回路２１のダイナミックレンジV_{AD2}の最大値２．０Ｖにおさめるために、そこで０．５倍されてから補正用アナログデジタル変換回路２１に入力される。そして、補正用アナログデジタル変換回路２１で８ビットのデジタルデータ（Ｄ１）に変換されてから、画像用メモリ２２にいったん記憶される。

【００２３】画像用メモリ２２から出力されるデータ

（Ｄ１）は、補正係数が格納された補正係数格納メモリ２３に入力され、そこから出力される８ビットのデータ（Ｄ２）によって、掛算器１６の増幅率Ａｖが制御される。なお、Ｄ１とＤ２との関係は、図７に特性曲線が示されるように、Ｄ２＝６４×２５６／Ｄ１（式１）としている。

【００２４】ここでは、図６における補正用アナログデジタル変換回路２７のダイナミックレンジV_{AD2}が２．０Ｖの時にＤ１＝２５６になり、Ｖｉｎが４．０ＶでＤ１＝２５６になる。したがって、Ｖｉｎ／４＝Ｄ１／２５６（式２）という式が成立する。また、掛算器１６の増幅率Ａｖは、Ｄ２が最大２５６でＡｖ＝Ｄ２／２５６（式３）になる。

【００２５】これらの式１～式３より、Ａｖ＝１／Ｖｉｎとなるから、掛算器１６からの出力は常に１Ｖになる。そこで、その信号を増幅器２８で２倍に増幅することによってV_{AD}である２．０Ｖにし、クランプ回路１７を経て主アナログデジタル変換回路１８に入力させる。

【００２６】このようにして、固体撮像素子２の各画素が飽和レベルのときの信号振幅が、全ての画素において主アナログデジタル変換回路１８入力のダイナミックレンジV_{AD}に揃えられるので、画面に黒点がでず、しかもノイズ劣化のない良質な画像を再生することができる。

【００２７】図８及び図９は本発明の第２の実施例を示しており、図８は全体構成を示す略図であり、図９は回路ブロック図である。上述の第１の実施例では、使用する内視鏡１を取り替える度にスイッチ２４を操作して、固体撮像素子２の各画素から出力される信号の飽和レベルの振幅データをとる手間が必要になる。

【００２８】そこでこの実施例では、内視鏡１を製造する段階で、固体撮像素子２の各画素から出力される信号の飽和レベルの振幅データをとっておき、そのデータと図７に示される補正特性とを掛け合わせたデータを読み出し専用メモリ（ＲＯＭ）３１に格納して、そのＲＯＭ３１を内視鏡１に内蔵させておく。

【００２９】そして、内視鏡１をビデオプロセッサ３に接続すると、内視鏡１内のＲＯＭ３１に格納されているデータが読み取られて、ＣＣＤプロセス回路１０内のランダムアクセスメモリ（ＲＡＭ）３２にそのデータが転送され、タイミング回路３３によって固体撮像素子２の駆動と同期をとって、掛算器１６の増幅率が第１の実施例と同様に画素単位で制御される。

【００３０】このようにすることにより、使用する内視鏡１を取り替える度に各画素の飽和レベルのデータを取る手間をかけることなく、各画素の飽和レベルの信号振幅を、全ての画素において主アナログデジタル変換回路１８入力のダイナミックレンジV_{AD}に揃えることができる。

【００３１】

【発明の効果】本発明によれば、固体撮像素子による撮

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像信号をアナログデジタル変換回路に入力させる前に、各画素の信号の飽和レベルの振幅の大きさをアナログデジタル変換回路の入力ダイナミックレンジに必要な最小限程度のレベルに揃えられるので、固体撮像素子の各画素から出力される飽和レベルの信号の振幅に画素間でばらつきがあっても、画面に黒点がでず、しかもノイズによる劣化のない品質の良い画像を再生することができる。

【図面の簡単な説明】

【図１】第１の実施例のＣＣＤプロセス回路のブロック図である。

【図２】第１の実施例の全体構成を示す略図である。

【図３】第１の実施例の信号波形を示す線図である。

【図４】第１の実施例の信号波形を示す線図である。

【図５】第１の実施例の信号波形を示す線図である。

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【図６】第１の実施例のＣＣＤプロセス回路の部分詳細ブロック図である。

【図７】第１の実施例の補正特性線図である。

【図８】第２の実施例の全体構成を示す略図である。

【図９】第２の実施例の回路ブロック図である。

【図１０】従来例のＣＣＤプロセス回路のブロック図である。

【図１１】従来例の信号波形を示す線図である。

【符号の説明】

２　固体撮像素子

１８　主アナログデジタル変換回路

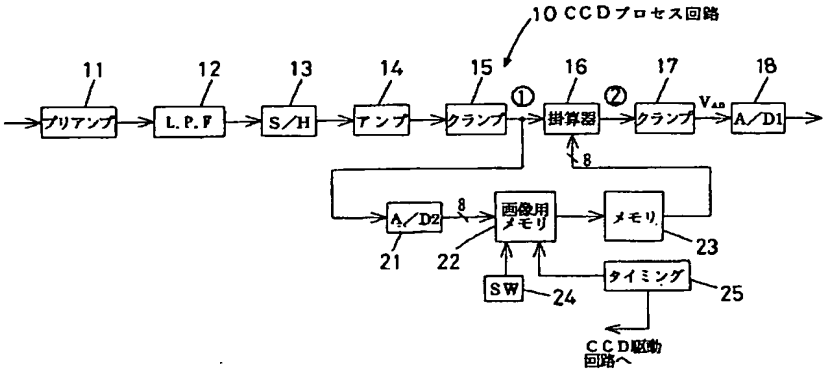
２１　補正用アナログデジタル変換回路

２２　画像用メモリ

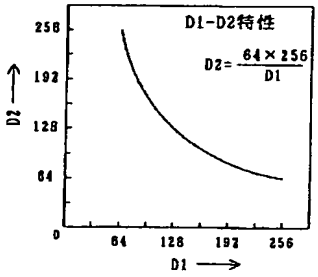
２３　補正係数格納メモリ

２４　スイッチ

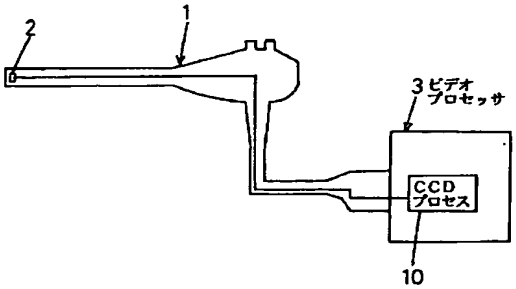
【図１】



【図７】

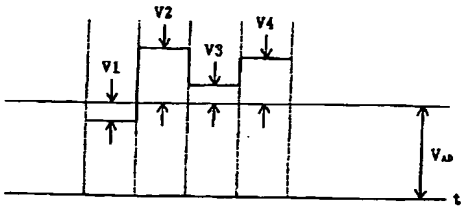


【図２】

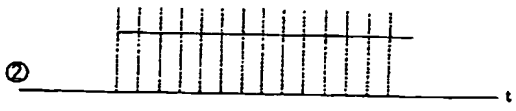


【図３】

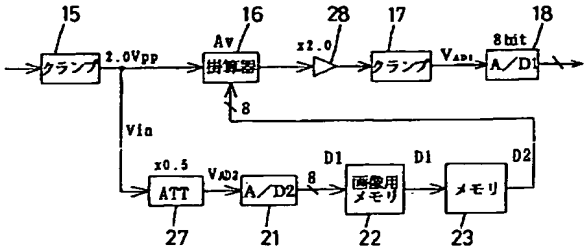
【図４】



【図５】



【図６】



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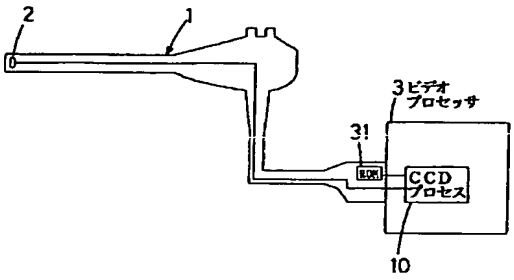

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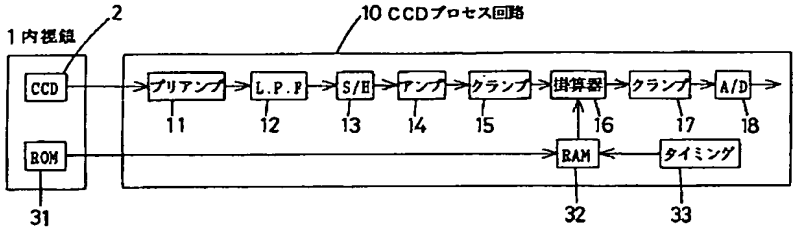
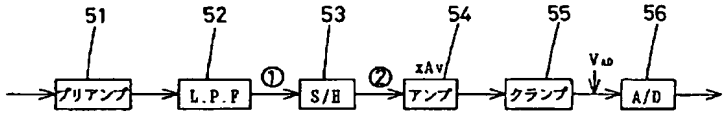
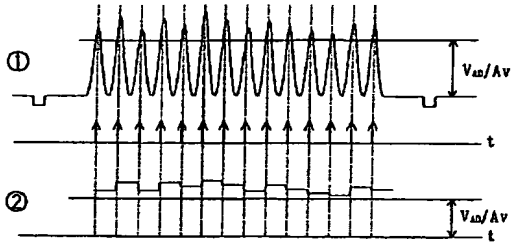


【図１０】



【図１１】



PATENT ABSTRACTS OF JAPAN

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H04N 5/243
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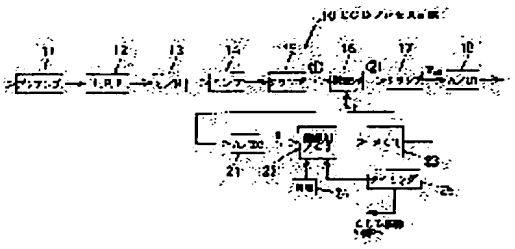
(21)Application number : **06-276158**
(22)Date of filing : **10.11.1994**

(71)Applicant : **ASAHI OPTICAL CO LTD**
(72)Inventor : **SUGIMOTO HIDEO**
OZAWA SATORU

(54) ELECTRONIC ENDOSCOPE DEVICE

(57)Abstract:
PURPOSE: To provide an electronic endoscope device capable of reproducing an image with high quality even when dispersion between picture elements exists in the amplitude of a signal of saturation level outputted from each picture element of a solid-state image pickup element.

CONSTITUTION: This device is provided with saturation level amplitude correction circuits 21, 22 and 23 to correct the signal level of each picture element so as to arrange the amplitude of saturation level of the signal of each picture element at the minimum level required for the input dynamic range of an analog/digital conversion circuit 18 before an image pickup signal is inputted to the analog/digital conversion circuit 18.



LEGAL STATUS

[Date of request for examination] 01.10.2001

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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] Sample the analog signal outputted from the solid state image pickup device arranged at the nose of cam of the endoscope insertion section with a sample hold circuit, and an image pck-up signal is extracted. In the electronic endoscope equipment changed into the digital signal by the analog-to-digital conversion circuit after amplifying it Before making the above-mentioned image pck-up signal input into the above-mentioned analog-to-digital conversion circuit Electronic endoscope equipment characterized by preparing the saturation level amplitude amendment circuit of an amendment sake for the signal level of each pixel so that the size of the amplitude of the saturation level of the signal of each pixel may be arranged with the level about [required for the input dynamic range of the above-mentioned analog-to-digital conversion circuit] the minimum.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the electronic endoscope equipment which prepared the solid state image pickup device which changes an observation picture into an electrical signal at the nose of cam of the endoscope insertion section.
[0002]
[Description of the Prior Art] Drawing 10 shows conventional electronic endoscope equipment, and after the analog signal outputted from the solid state image pickup device (not shown) arranged at the nose of cam of the endoscope insertion section is first amplified by suitable level by the preamplifier 51, a high frequency component etc. is cut in a low pass filter 52.
[0003] Subsequently, in a sample hold circuit 53, the output signal from each pixel of a solid state image pickup device is sampled, an image pck-up signal is extracted, and after the signal is amplified with the following amplifier 54 to the grade exceeding the input dynamic range of the analog-to-digital conversion circuit 56, waveform shaping which arranges the direct current level of one side by the clamping circuit 55 is performed.
[0004] And after the signal is changed into a digital signal in the analog-to-digital conversion circuit 56, it is sent to the next image-processing circuit which is not illustrated, and the video signal for reproducing a color picture is generated.
[0005]
[Problem(s) to be Solved by the Invention] In the above circuits, there is dispersion in the amplitude of the saturation level of the signal outputted from each pixel of a solid state image pickup device between pixels.
[0006] That is, input signal ** and output signal ** to a sample hold circuit 53 in case the signal of saturation level is outputted in order from each pixel of a solid state image pickup device were illustrated, dispersion in an amplitude was amplified with amplifier 54, and drawing 11 has appeared as it is. VAD is the dynamic range of analog-to-digital conversion circuit 56 input, and Av is the gain of amplifier 54.
[0007] Thus, since dispersion between the pixels of the amplitude of the saturation level of the signal outputted from each pixel appears as it is in I/O of a sample hold circuit 53, when there is a pixel signal with which the input level to a sample hold circuit 53 is less than a dynamic range, image display of the pixel will be carried out as a sunspot, and it will spoil picture quality remarkably.
[0008] However, in order to avoid such a phenomenon, when the amplification factor of amplifier 54 is gathered, a picture noise will come to be conspicuous and, on the whole, picture quality will deteriorate shortly.
[0009] Then, even if this invention has dispersion in the amplitude of the signal of the saturation level outputted from each pixel of a solid state image pickup device between pixels, it aims at offering the electronic endoscope equipment which can reproduce a quality picture.
[0010]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the electronic endoscope equipment of this invention Sample the analog signal outputted from the solid state image pickup device arranged at the nose of cam of the endoscope insertion section with a sample hold circuit, and an image pck-up signal is extracted. In the electronic endoscope equipment changed into

the digital signal by the analog-to-digital conversion circuit after amplifying it Before making the above-mentioned image pck-up signal input into the above-mentioned analog-to-digital conversion circuit It is characterized by preparing the saturation level amplitude amendment circuit of an amendment sake for the signal level of each pixel so that the size of the amplitude of the saturation level of the signal of each pixel may be arranged with the level about [required for the input dynamic range of the above-mentioned analog-to-digital conversion circuit] the minimum.
[0011]
[Example] An example is explained with reference to a drawing. It is the schematic drawing showing the whole electronic endoscope equipment composition, and an endoscope observation picture is picturized, the signal outputted from the solid state image pickup device 2 is sent to the video processor 3 connected to the endoscope 1 by the solid state image pickup device 2 which was built in at the nose of cam of the insertion section of an endoscope 1 and which consists of a charge-coupled device (CCD), for example, and drawing 2 is inputted into the CCD process circuit 10 in the video processor 3.
[0012] Drawing 1 shows the CCD process circuit 10, and after the analog signal outputted from the solid state image pickup device 2 is first amplified by suitable level by the preamplifier 11, a high frequency component etc. is cut in a low pass filter 12.
[0013] Subsequently, in a sample hold circuit 13, the output signal from each pixel of a solid state image pickup device 2 is sampled, an image pck-up signal is extracted, and after the signal is amplified with the following amplifier 14 to the grade exceeding the input dynamic range of the main analog-to-digital conversion circuit 18, waveform shaping which arranges the direct current level of one side by the clamping circuit 15 is performed. So far, it is the same as the conventional circuit shown in drawing 10 .
[0014] The signal in ** outputted from the clamping circuit 15 is a video signal which has dispersion in the amplitude of the saturation level of the signal outputted from each pixel, as shown in drawing 3 .
[0015] While the high precision amplifier (henceforth a "multiplier") 16 which can control amplification degree by 8-bit digital data with high precision is connected to the analog signal inputted, multipoint connection of the analog-to-digital conversion circuit 21 for an amendment which outputs 8-bit digital data, for example is carried out to the outgoing end of a clamping circuit 15.
[0016] In case an endoscope is used, a very bright photographic subject is first picturized by the solid state image pickup device 2 as preparation, the output signal from all pixels is made into a saturation state, and the signal is made to input into the analog-to-digital conversion circuit 21 for an amendment in this example.
[0017] And the following memory 22 for pictures is made to memorize the signal of the saturation level of all the pixels of a solid state image pickup device 2. Such housekeeping operation shall be performed only when the switch 24 arranged at the control panel of the video processor 3 is pushed.
[0018] In the usual observation state after the signal of the saturation level of all pixels was memorized by the memory 22 for pictures, a drive and synchronization of a solid state image pickup device 2 are taken by the timing circuit 25, and the saturation level data corresponding to each pixel are outputted from the memory 22 for pictures. Therefore, if it will be in the state, the function of the analog-to-digital conversion circuit 21 for an amendment will not be used any longer.
[0019] The data outputted from the memory 22 for pictures are inputted into the correction-factor storing memory 23 in which the correction factor was stored. A correction factor is a coefficient of an amendment sake, as the data V1-V4 inputted from the memory 22 for pictures as shown in drawing 4 are altogether arranged with the dynamic range VAD of the input of the main analog-to-digital conversion circuit 18.
[0020] Thus, the correction factor corresponding to each pixel is outputted from the correction-factor storing memory 23, it is inputted into a multiplier 16, and the amplification factor of a multiplier 16 is controlled for every pixel. Consequently, the signal amplitude of the saturation level of each pixel in ** of drawing 1 outputted from a multiplier 16 is arranged with the dynamic range VAD of the input of the main analog-to-digital conversion circuit 18 in all pixels, as shown in drawing 5 .
[0021] Subsequently, after waveform shaping which arranges the direct current level of one side by

the clamping circuit 17 is performed, the signal outputted from a multiplier 16 is changed into a digital signal by the main analog-to-digital conversion circuit 18, and is outputted towards the image-processing circuit for generating a video signal.
[0022] It is a block diagram for explaining in more detail the circuit portion which performs an above-mentioned signal amendment, the signal (Vin) of 2.0Vpp(s) outputted from a clamping circuit 15 is inputted into an attenuator (ATT) 27, and drawing 6 is the dynamic range VAD2 of the analog-to-digital conversion circuit 21 for an amendment. It is inputted into the analog-to-digital conversion circuit 21 for an amendment, after doubling 0.5 there, in order to store in maximum 2.0V. And after being changed into 8-bit digital data (D1) by the analog-to-digital conversion circuit 21 for an amendment, the memory 22 for pictures once memorizes.
[0023] The data (D1) outputted from the memory 22 for pictures are inputted into the correction-factor storing memory 23 in which the correction factor was stored, and the amplification factor Av of a multiplier 16 is controlled by the 8-bit data (D2) outputted from there. In addition, relation between D1 and D2 is set to D2=64x256 / D1 (formula 1), as a characteristic curve is shown in drawing 7 .
[0024] Dynamic range VAD2 of the analog-to-digital conversion circuit [in / drawing 6 / here] 27 for an amendment When it is 2.0V, it is set to D1=256, and Vin is set to D1=256 by 4.0V. Therefore, a formula called Vin/4=D1 / 256 (formula 2) is materialized. Moreover, as for the amplification factor Av of a multiplier 16, D2 becomes Av=D 2/256 (formula 3) by a maximum of 256.
[0025] Since it is set to Av=1/Vin, the output from a multiplier 16 is always set to 1V from these formulas 1 - a formula 3. Then, it is made 2.0V which are VAD and is made to input into the main analog-to-digital conversion circuit 18 through a clamping circuit 17 by amplifying the signal to double precision with amplifier 28.
[0026] Thus, since a signal amplitude in case each pixel of a solid state image pickup device 2 is saturation level is arranged with the dynamic range VAD of main analog-to-digital conversion circuit 18 input in all pixels, a sunspot can reproduce on a screen the good picture which moreover does not have noise degradation.
[0027] Drawing 8 and drawing 9 show the 2nd example of this invention, drawing 8 is the schematic drawing showing whole composition, and drawing 9 is a circuit block diagram. In the 1st above-mentioned example, whenever it exchanges the endoscope 1 to be used, a switch 24 is operated, and the time and effort which takes the amplitude data of the saturation level of the signal outputted from each pixel of a solid state image pickup device 2 is needed.
[0028] Then, the data which multiplied the amendment property shown in a special, and its data and drawing 7 in the amplitude data of the saturation level of the signal outputted from each pixel of a solid state image pickup device 2 are read, it stores in the exclusive memory (ROM) 31, and the ROM31 is made to build in an endoscope 1 by the stage of manufacturing an endoscope 1, in this example.
[0029] And if an endoscope 1 is connected to the video processor 3, the data stored in ROM31 in an endoscope 1 are read, the data is transmitted to RAM (RAM) 32 in the CCD process circuit 10, a drive and synchronization of a solid state image pickup device 2 will be taken, and the amplification factor of a multiplier 16 will be controlled by the timing circuit 33 per pixel like the 1st example.
[0030] The signal amplitude of the saturation level of each pixel can be arranged with the dynamic range VAD of main analog-to-digital conversion circuit 18 input in all pixels, without applying the time and effort which takes the data of the saturation level of each pixel whenever it exchanges the endoscope 1 used by doing in this way.
[0031]
[Effect of the Invention] Before making the image pck-up signal by the solid state image pickup device input into an analog-to-digital conversion circuit according to this invention Since the size of the amplitude of the saturation level of the signal of each pixel is arranged with the level about [required for the input dynamic range of an analog-to-digital conversion circuit] the minimum Even if dispersion is in the amplitude of the signal of the saturation level outputted from each pixel of a solid state image pickup device between pixels, a sunspot cannot come out to a screen but a picture with the sufficient quality which moreover does not have degradation by the noise can be reproduced.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the CCD process circuit of the 1st example.
[Drawing 2] It is the schematic drawing showing the 1st whole example composition.
[Drawing 3] It is the diagram showing the signal wave form of the 1st example.
[Drawing 4] It is the diagram showing the signal wave form of the 1st example.
[Drawing 5] It is the diagram showing the signal wave form of the 1st example.
[Drawing 6] It is the partial detailed block diagram of the CCD process circuit of the 1st example.
[Drawing 7] It is the amendment ultimate-lines view of the 1st example.
[Drawing 8] It is the schematic drawing showing the 2nd whole example composition.
[Drawing 9] It is the circuit block diagram of the 2nd example.
[Drawing 10] It is the block diagram of the CCD process circuit of the conventional example.
[Drawing 11] It is the diagram showing the signal wave form of the conventional example.
[Description of Notations]
2 Solid State Image Pickup Device
18 The Main Analog-to-digital Conversion Circuit
21 Analog-to-digital Conversion Circuit for Amendment
22 Memory for Pictures
23 Correction-Factor Storing Memory
24 Switch

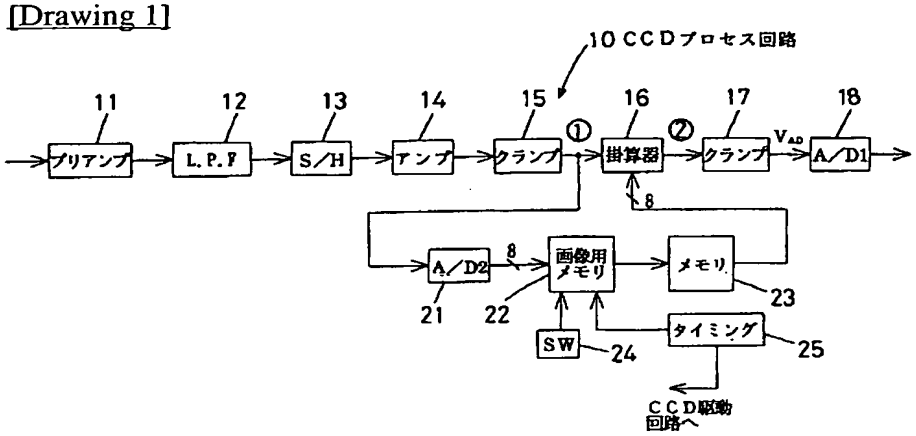
[Translation done.]

* NOTICES *

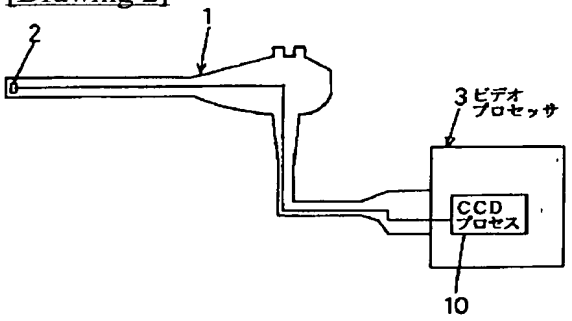
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

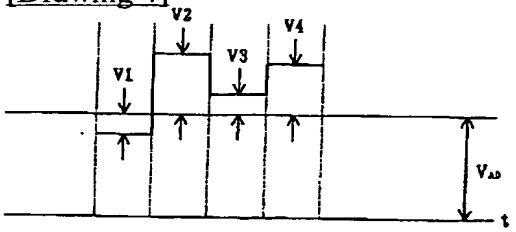


[Drawing 2]



[Drawing 3]

[Drawing 4]



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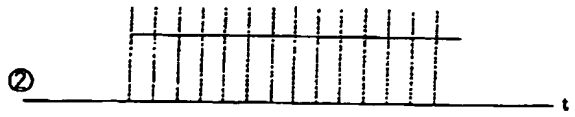

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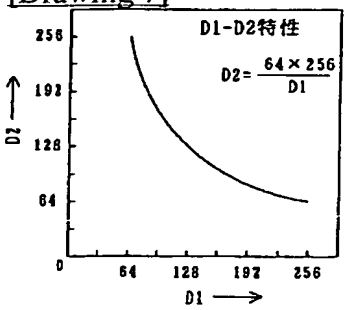

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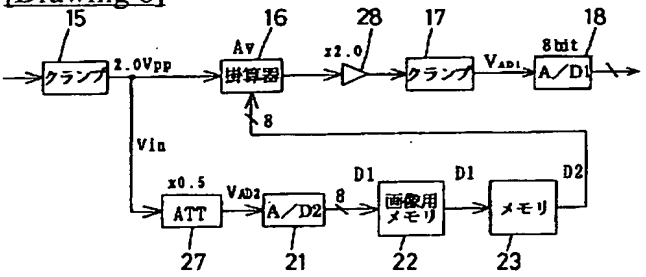

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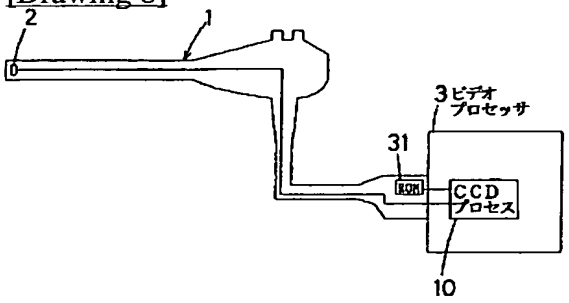

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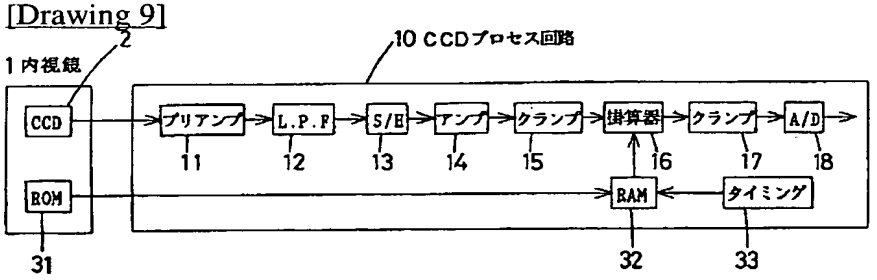

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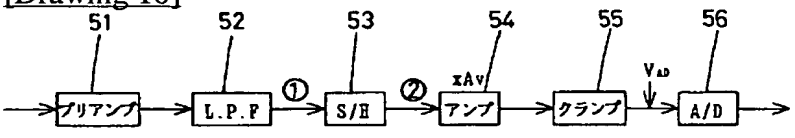
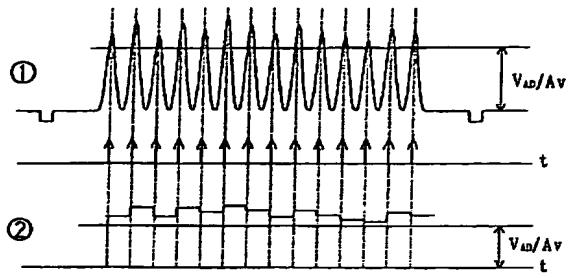


[Drawing 11]



[Translation done.]

* NOTICES *

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of the amendment by the convention of 2 of Article 17 of patent law.
[Section partition] The 2nd partition of the 1st section.
[Date of issue] January 15, Heisei 14 (2002. 1.15)

[Publication No.] JP,8-131401,A.
[Date of Publication] May 28, Heisei 8 (1996. 5.28)
[**** format] Open patent official report 8-1315.
[Filing Number] Japanese Patent Application No. 6-276158.
[The 7th edition of International Patent Classification]

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G02B 23/24
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[FI]

A61B 1/04 372
G02B 23/24 B
H04N 5/243
7/18 M

[Procedure revision]
[Filing Date] October 1, Heisei 13 (2001. 10.1)
[Procedure amendment 1]
[Document to be Amended] Specification.
[Item(s) to be Amended] Claim.
[Method of Amendment] Change.
[Proposed Amendment]
[Claim(s)]
[Claim 1] After sampling the analog signal outputted from the solid state image pickup device arranged at the nose of cam of the insertion section of an endoscope with a sample hold circuit, extracting an image pck-up signal and amplifying it, it is electronic endoscope equipment changed into the digital signal by the analog-to-digital conversion circuit.
In what established the saturation level amplitude amendment circuit of an amendment sake in the video processor to which the signal level of each pixel was connected in the above-mentioned endoscope so that the size of the amplitude of the saturation level of the signal of each pixel might be arranged with the level about [required for the input dynamic range of the above-mentioned analog-to-digital conversion circuit] the minimum before making the above-mentioned image pck-up signal input into the above-mentioned analog-to-digital conversion circuit
By arranging the memory which stored the amendment data which multiplied the amplitude data of the saturation level of the signal outputted from each pixel of the above-mentioned solid state image

pickup device, and the predetermined amendment property to the above-mentioned endoscope, and connecting the above-mentioned endoscope to the above-mentioned video processor Electronic endoscope equipment characterized by reading the above-mentioned amendment data from the above-mentioned memory, sending them to the above-mentioned saturation level amplitude amendment circuit, and performing an amendment of the signal level of each above-mentioned pixel with the above-mentioned amendment data.
[Procedure amendment 2]
[Document to be Amended] Specification.
[Item(s) to be Amended] 0011.
[Method of Amendment] Change.
[Proposed Amendment]
[0011]
[Example] The example of reference is explained with reference to a drawing. It is the schematic drawing showing the whole electronic endoscope equipment composition, and an endoscope observation picture is picturized, the signal outputted from the solid state image pickup device 2 is sent to the video processor 3 connected to the endoscope 1 by the solid state image pickup device 2 which was built in at the nose of cam of the insertion section of an endoscope 1 and which consists of a charge-coupled device (CCD), for example, and drawing 2 is inputted into the CCD process circuit 10 in the video processor 3.
[Procedure amendment 3]
[Document to be Amended] Specification.
[Item(s) to be Amended] 0016.
[Method of Amendment] Change.
[Proposed Amendment]
[0016] In case an endoscope is used, a very bright photographic subject is first picturized by the solid state image pickup device 2 as preparation, the output signal from all pixels is made into a saturation state, and the signal is made to input into the analog-to-digital conversion circuit 21 for an amendment in this example of reference.
[Procedure amendment 4]
[Document to be Amended] Specification.
[Item(s) to be Amended] 0027.
[Method of Amendment] Change.
[Proposed Amendment]
[0027] Drawing 8 and drawing 9 show the example of this invention, drawing 8 is the schematic drawing showing whole composition, and drawing 9 is a circuit block diagram. In the above-mentioned example of reference, whenever it exchanges the endoscope 1 to be used, a switch 24 is operated, and the time and effort which takes the amplitude data of the saturation level of the signal outputted from each pixel of a solid state image pickup device 2 is needed.
[Procedure amendment 5]
[Document to be Amended] Specification.
[Item(s) to be Amended] 0029.
[Method of Amendment] Change.
[Proposed Amendment]
[0029] And if an endoscope 1 is connected to the video processor 3, the data stored in ROM31 in an endoscope 1 are read, the data is transmitted to RAM (RAM) 32 in the CCD process circuit 10, a drive and synchronization of a solid state image pickup device 2 will be taken, and the amplification factor of a multiplier 16 will be controlled by the timing circuit 33 per pixel like the above-mentioned example of reference.
[Procedure amendment 6]
[Document to be Amended] Specification.
[Item(s) to be Amended] Easy explanation of a drawing.
[Method of Amendment] Change.
[Proposed Amendment]
[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the CCD process circuit of the example of reference of this

invention.
[Drawing 2] It is the schematic drawing showing the whole example composition of reference of this invention.
[Drawing 3] It is the diagram showing the signal wave form of the example of reference of this invention.
[Drawing 4] It is the diagram showing the signal wave form of the example of reference of this invention.
[Drawing 5] It is the diagram showing the signal wave form of the example of reference of this invention.
[Drawing 6] It is the partial detailed block diagram of the CCD process circuit of the example of reference of this invention.
[Drawing 7] It is the amendment ultimate-lines view of the example of reference of this invention.
[Drawing 8] It is the schematic drawing showing the whole example composition of this invention.
[Drawing 9] It is the circuit block diagram of the example of this invention.
[Drawing 10] It is the block diagram of the CCD process circuit of the conventional example.
[Drawing 11] It is the diagram showing the signal wave form of the conventional example.
[Description of Notations]
2 Solid state image pickup device.
18 The main analog-to-digital conversion circuit.
21 The analog-to-digital conversion circuit for an amendment.
22 Memory for pictures.
23 Correction-factor storing memory.
24 Switch.

[Translation done.]